Alcoa Inc.

Draft Pre-Design Investigation Data Summary Report

Grasse River Study Area

Massena, New York

March 2015

Tables

7. Baseline Monitoring (Task 6)

The objective of the baseline monitoring was to establish pre-remediation conditions for use in determining the effectiveness of the selected remedy. Baseline monitoring consisted of periodic water column (Section 7.1) and fish tissue (Section 7.2) sampling at various locations within the lower Grasse River, along with a single event within the St. Lawrence River. The remainder of this section identifies the baseline monitoring activities conducted and summarizes the results of these activities. Subsequent to the preparation of the QAPP and QAPP Addendum, Alcoa has been requested to submit a stand-alone baseline monitoring plan to USEPA. It is anticipated that this document will be submitted to the Agencies in the first quarter of 2015.

7.1 Water Column Monitoring

7.1.1 Field Activities

Water column monitoring was performed monthly between May and October 2014 (for a total of six sampling rounds) to obtain additional baseline water column data and continue the Supplemental Remedial Studies (SRS) program. Water column samples were collected from five locations (Figure 7-1): Main Street Bridge in Massena (WCMSB); Route 131 Bridge (WC131); water column transect (WC) 011; WC013; and the Power Canal (WCPC). Samples were collected from these five locations on the dates provided below.

- Round 1: May 27, 2014
- Round 2: June 26, 2014
- Round 3: July 21, 2014
- Round 4: August 22, 2014
- Round 5: September 19, 2014
- Round 6: October 17, 2014

During each event, samples were collected at each location using a stainless steel Kemmerer water sampler. At WC131, WC011, and WC013, one sample was collected mid-channel from each location at 0.2 and 0.8 times the total water column depth (i.e., total of two samples per location). At WCMSB and WCPC, one sample was collected from each location at 0.5 times the total water column depth. Sampling was performed via boat at all locations except WCMSB, where samples were collected just downstream of the Main Street Bridge from the north shore as water depths and access limitations precluded collection with a boat.

Prior to the collection of samples at WC131, WC011, and WC013, the total water column depth was recorded, and specific conductivity and water temperature measurements were obtained every 2 feet in the water column (at mid-channel) to check for the presence of stratification. Field water quality measurements of specific conductivity, water temperature, pH, turbidity, and dissolved oxygen (DO) were also collected at 0.2 and 0.8 times the total water column depth (at mid-channel). Similarly, these field parameters were collected at WCMSB and WCPC at 0.5 times the total water column depth. Note that water quality parameters were not obtained during the October 17, 2014 round at WC131, WC011, and WC013 due to equipment malfunction.

All monitoring activities were conducted in accordance with the PDI QAPP and PDI QAPP Addendum No. 1 (Alcoa, October 2013 and December 2014). A total of 48 field samples (not including QA/QC samples) were packaged and submitted to Pace for analysis of PCB congeners and total suspended solids (TSS). QA/QC sampling included the collection of an equipment rinse blank before and after each sampling round, as well as one duplicate and one MS/MSD each round. The equipment rinse blank and MS/MSD samples were analyzed for PCB congeners, and the duplicate samples were analyzed for PCB congeners and TSS. A summary of the results from the baseline water column sampling is provided in Section 7.1.2.

7.1.2 Summary of Results

PDI water column monitoring data from 2014 can be found in Appendix C in the Microsoft Access and EQuIS data tables entitled climate, riverflow_ChaseMills, riverflow_hist, riverflow_tapedown, water_field, and water_iupac. PCB and TSS results for 2014 are also summarized in Tables 7-1 and 7-2, respectively. The data validation report is provided in Appendix B.

7.1.2.1 River Flow and Precipitation

Daily flow and precipitation data measured in 2014 are shown on Figure 7-2. The 2014 annual average flow estimated from 15-minute provisional flow records from the U.S. Geological Survey (USGS) gage on the Grasse River at Chase Mills was approximately 1,298 cubic feet per second (cfs), slightly higher than the historic long-term average Grasse River flow of 1,100 cfs (Alcoa, April 2001). At the Chase Mills gage, the spring-time peak daily average flow of 10,243 cfs was observed in mid-April and was within the range of typical spring flows for the lower Grasse River (Alcoa, July 2012, July 2011, July 2010). A second high flow event, reaching 6,412 cfs, occurred in early May, before decreasing into the summer months (i.e., June through September). Summertime flows averaged approximately 722 cfs, while fall and early winter (i.e., October through December) flows were, on average, slightly higher (808 cfs).

Total precipitation measured near Outfall 007 during 2014 was approximately 30 inches, which is higher than the total precipitation in 2012 (23 inches) and equal to the long-term annual average of 30 inches. The maximum daily precipitation of 1.6 inches occurred on August 31, 2014.

7.1.2.2 Water Quality

Stratification occurs in the lower Grasse River when colder water with higher specific conductivity (relative to the Grasse River water) from the St. Lawrence River enters into and moves upstream along the bottom of the lower Grasse River. Based on previous evaluations, differences of approximately 3 to 5 degrees Celsius (°C) in water temperature and approximately 20 micro Siemens per centimeter (μS/cm) in specific conductivity between the two water masses (i.e., 0.2 and 0.8 times the total water column depths) were used to identify the existence of stratification. Based on these criteria, water temperature data showed the river was stratified at WC131 and WC013 in May, WC011 and WC013 in June, and WC131 to WC013 in July (Figure 7-3). Similar patterns were observed in the specific conductivity data at WC011 and WC013; however, conductivity measurements suggest stratification only at WC131 in July. At WC013, conductivity data also suggests the river was stratified in mid-September.

TSS levels measured throughout the river were generally low (Figure 7-4). At WCMSB, the average TSS concentration was 5.4 milligrams per liter (mg/L). Average TSS levels in the lower river were slightly lower, ranging from an average of 2.5 mg/L at WC011 to 2.6 mg/L at WC013 (excluding the elevated measurement of 77.3 nanogram per liter [ng/L]). The highest TSS concentration of 77.3 mg/L was observed at WC013 in the lower water column on May 27, 2014 (at an estimated flow of about 985 cfs). This TSS measurement is significantly elevated relative to historic Grasse River measurements and is believed to be representative of water from the Snell Lock. An opening of the nearby Snell Lock occurred at the time of sampling at WC013 and stratification is evident in the temperature and conductivity data collected at this location (Figure 7-3).

7.1.2.3 PCBs

PCB concentrations measured at the Main Street Bridge were below detectable limits during all rounds in 2014. At the lower river locations, PCB concentrations were typically low, measuring below 50 ng/L throughout the year (Figure 7-5), with the exception of the deep water column sample collected at WC131 on July 21, 2014 with a PCB concentration of 101 ng/L. As in past years, PCB concentrations in the summer were generally higher than those in the spring or fall. PCB mass flux (i.e., the product of PCB concentration and river flow) was calculated to account for seasonal differences in river flow. Average PCB mass flux was highest in June due to elevated flows occurring at that time (daily average flow of 3,055 cfs on June 26), with slightly lower levels observed in the spring and fall months (Figure 7-6).

Water column PCB levels varied spatially in the lower Grasse River (Figure 7-7). August was the only month in which water temperature and specific conductivity data did not indicate stratification at any sampling location. Generally, PCB levels in the upper water column samples indicate a gradual upstream to downstream increase in PCB concentrations. The lower water column sample results peaked at WC131 or WC011, and tend to decrease at WC013, with the exception of the September results. The PCB levels at WC013 in the lower water column samples were consistently lower than the upper water column, which is likely due to dilution of Grasse River water with St. Lawrence River water.

7.1.2.4 Comparison to Historic Data

In general, water column PCBs measured in 2014 were within the range of historic levels (Figures 7-8a and 7-8b). At WC131, WC011 and WC013 spring time PCB concentrations measured in 2014 were higher than those measured in 2012, but were within the range of recent years. Summer and fall concentrations in 2014 were similar to or slightly lower than those measured in 2012. Similar trends are observed in PCB mass flux (Figures 7-9a and 7-9b).

7.2 Fish Monitoring

7.2.1 Field Activities

The baseline fish sampling was performed between August 25 and September 4, 2014 and on October 2, 2014 in accordance with the PDI QAPP and PDI QAPP Addendum No. 1 (Alcoa, October 2013 and December 2014). Sampling efforts were conducted in the Massena Power Canal, four stretches of the lower Grasse River (Background, Upper, Middle, and Lower), and the Grasse River mouth. The resident fish species targeted during this program were adult (≥25 centimeters [cm]) smallmouth bass (*Micropterus dolomieui*), adult (≥25 cm) brown bullhead (*Ictalurus nebulosus*), and young-of-year (YOY) (<6.5 cm) spottail shiner (*Notropis hudsonius*). Fish were collected using boat-mounted electrofishing equipment. A summary of the fish targeted and captured as part of this program is provided in Table 7-3 and discussed below.

For the adult resident fish program, 17 adult smallmouth bass were collected from the Massena Power Canal, and 17 adult smallmouth bass and 18 adult brown bullhead were collected from each of the Upper, Middle, and Lower Stretches of the river. Five adult smallmouth bass and five adult brown bullhead were collected from the Background Stretch. Sampling of adult smallmouth bass and adult brown bullhead from the St. Lawrence River was performed in 2014 for the first time at the request of USEPA, and additional details regarding this sampling is provided in Section 7.3. Of the five bullhead collected from the Background Stretch, one was smaller than 25 cm (24.0 cm) due to a lack of larger fish being available. Approximate adult smallmouth bass and brown bullhead collection locations are shown on Figures 7-10 and 7-11, respectively. The length and weight of each individual bass and bullhead collected are summarized in Table 7-4.

Three YOY spottail shiner composite samples were collected from each of four historic locations occurring along the northern shoreline within the Study Area: near Outfall 001 (Upper Stretch); near the Unnamed Tributary (Middle Stretch); along the northern shoreline near the mouth of the river (downstream of the Lower Stretch); and within the Background Stretch. Note that YOY samples from near the mouth were collected during two events; one composite was collected September 3, 2014 and the other two composites were collected October 2, 2014. Field crews have historically had trouble obtaining the sample size at this location, and after repeated attempts to collect spottail shiners at this location, sampling efforts were extended upstream with the remaining two samples obtained near the AmVets boat launch (approximately T66, 4 to 6 transects upstream of the typical historic sample collection location area [T70-T72]).

At the request of USEPA, three additional YOY spottail shiner composite samples were collected from each of three new locations within the Study Area for the first time in 2014. The new locations all occur along the southern shoreline, near T27 (Middle Stretch), near T50 (Lower Stretch), and near the mouth of the river (downstream of the Lower Stretch). Each whole-body composite sample contained between 8 and 27 fish. The minimum and maximum length of fish in a sample and the total weight of each sample are summarized in Table 7-5. Approximate spottail shiner collection locations are provided on Figure 7-12.

In total, 153 fish samples were packaged in the field and shipped to Pace for processing and analysis of PCB Aroclors and lipids. These included 73 adult smallmouth bass fillets (skin-on, scales-off New York State standard fillet), 59 adult brown bullhead fillets (skin-off New York State standard fillet), and 21 YOY spottail shiner whole-body composite samples. QA/QC samples consisted of one MS/MSD sample per 20 samples collected, which were prepared by the laboratory from the submitted fish samples. A summary of the results is provided in Section 7.2.2.

7.2.2 Summary of Results

7.2.2.1 PCB Results

Results of the 2014 resident fish sampling from can be found in Appendix C in the Microsoft Access and EQuIS data table entitled resfish_aro. PCB results also are listed in Tables 7-4 and 7-5 and are discussed below by species. A data validation report is provided in Appendix B.

Smallmouth Bass

Average PCB concentrations for smallmouth bass are shown on the two left panels on Figure 7-13. Average lipid-normalized PCB concentrations were highest in the Upper Stretch (178 mg/kg lipid) and about a factor of two lower in the Middle and Lower Stretches (70 and 86 mg/kg lipid, respectively). The average lipid-normalized PCB concentration in smallmouth bass from the Massena Power Canal was 10 mg/kg lipid, which is approximately 7 to 17 times lower than those from the Grasse River. The average lipid-normalized PCB concentration in the Background Stretch was 9 mg/kg lipid.

On a wet-weight basis, average PCB concentrations follow a similar trend, with the highest levels observed in the Upper Stretch (1.8 mg/kg) and lower levels in the Middle and Lower Stretches (0.7 and 1.0 mg/kg, respectively). PCB levels were below the detection limit (approximately 0.05 mg/kg) in three of the five samples collected from the Background Stretch, and the two samples with detectable levels had concentrations of 0.07 and 0.3 mg/kg. The average wet-weight PCB concentration in smallmouth bass from the Massena Power Canal was 0.11 mg/kg[4] (3 out of 17 samples were below the detection limit).

Brown Bullhead

Average PCB concentrations for brown bullhead are shown on the two middle panels on Figure 7-13. Lipid-normalized PCB levels were below detection in the Background Stretch (due to wet-weight PCB levels that were reported below the detection limit). Average lipid-normalized PCB levels were similar in the Upper and Middle Stretches (68 and 69 mg/kg lipid, respectively) and decrease slightly downstream in the Lower Stretch (57 mg/kg lipid). Statistical differences were not observed between the lower river sampling locations.

On a wet-weight basis, average PCB concentrations in the Upper, Middle, and Lower Stretches were similar, with 0.7, 0.6, and 0.5 mg/kg measured, respectively. PCB levels in brown bullhead samples were below the detection limit (approximately 0.05 mg/kg) in the Background Stretch.

Young-of-Year Spottail Shiner

Average PCB concentrations for YOY spottail shiner are shown on the left two panels on Figure 7-13. Three new locations along the southern shoreline were added to the spottail shiner sampling in 2014: near T27 (Middle Stretch), near T50 (Lower Stretch), and near the mouth of the river (downstream of the Lower Stretch). PCB levels at the three newly sampled locations were similar to those of the fish collected from historically targeted areas (along the northern shore). Overall, average lipid-normalized and wet-weight PCB levels in spottail shiner collected between Outfall 001 and T66 exhibit no consistent spatial trends. Both lipid-normalized and wet-weight PCB levels in spottail shiner collected close to the river mouth are lower than those from the upstream locations.

7.2.2.2 Comparison to Historic Data

Historic data for smallmouth bass are presented on Figures 7-14 and 7-15. Lipid-based PCB levels in 2014 are similar to or less than those measured over the past several years. Overall, average lipid-based PCBs measured in smallmouth bass

[4] PCB levels below the detection limit (approximately 0.05 mg/kg) are set to half the detection limit for the purposes of estimating an average concentration.

from the Upper Stretch have declined from approximately 1,470 mg/kg lipid during the mid-1990s to approximately 179 mg/kg lipid in 2014, representing an 88% decline over this period. Similarly, average lipid-based PCBs in smallmouth bass have declined from approximately 1,540 mg/kg lipid to approximately 70 mg/kg lipid in the Middle Stretch (representing a 95% decline) and approximately 1,350 mg/kg lipid to approximately 87 mg/kg lipid in the Lower Stretch (representing a 94% decline) over this same period (i.e., 1993 to 2014). Average lipid-based PCBs measured in smallmouth bass collected from the Massena Power Canal are the lowest on record (10 mg/kg lipid). Similar patterns were observed in PCB concentration on a wet-weight basis.

Historic data for brown bullhead are shown on Figure 7-16. Overall, average lipid-based PCBs in brown bullhead from the Upper Stretch have declined from approximately 660 mg/kg lipid during the early to mid-1990s to approximately 68 mg/kg lipid in 2014, representing a 90% decline over this period. Similarly, average lipid-based PCBs in brown bullhead have declined from approximately 890 mg/kg lipid to approximately 69 mg/kg lipid in the Middle Stretch (representing a 92% decline) and from approximately 820 mg/kg lipid to approximately 57 mg/kg lipid in the Lower Stretch (representing a 93% decline) over this same period (i.e., 1993 to 2014). Similar patterns were observed in PCB concentration on a wet-weight basis.

Historic data for YOY spottail shiner are presented on Figure 7-17[5]. In order to present a clear comparison to the monitoring that has occurred historically, the results of the newly added sampling locations along the southern shoreline are not included on this figure or the statistics provided below. Average wet-weight and lipid-based PCB levels in 2014 are similar to, or slightly lower than, levels measured in recent years. Average lipid-based PCB levels near Outfall 001 and near the Unnamed tributary are the lowest on record (24 and 17 mg/kg lipid, respectively; 1998 to 2014). Overall, average lipid-based PCBs in spottail shiner from near Outfall 001 have declined from approximately 150 mg/kg lipid in 1999 to 24 mg/kg lipid in 2014, representing an 84% decline over this period. Similarly, average lipid-based PCBs in spottail shiner have declined from approximately 165 mg/kg lipid to 17

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[5] Prior to 2001, YOY spottail shiners were not specifically targeted for collection; collection consisted of both adult and YOY spottail shiners. Figure 7-17 includes composite samples of fish with a maximum length of 65 millimeters, the current monitoring program's criterion for distinguishing between YOY and adult spottail shiners. Also, in 2001, two groups of spottail shiners were observed in the field; one group consisted of spottail shiners spawned in the spring, and the other contained spottail shiners spawned in the late summer/early fall. For proper comparison, only the results for the YOY spottail shiners spawned in the spring were considered.

mg/kg lipid near the Unnamed Tributary (representing a 90% decline) and from approximately 36 mg/kg lipid to 20 mg/kg lipid near the River Mouth (representing a 44% decline) over this same period (i.e., 1999 to 2014). Similar patterns were observed in PCB concentration on a wet-weight basis.

7.3 St. Lawrence River Monitoring

7.3.1 Field Activities

As directed by USEPA, additional baseline sampling was performed in the St. Lawrence River. These activities were conducted in accordance with the procedures identified in the PDI QAPP and PDI QAPP Addendum No. 1 (Alcoa, October 2013 and December 2014), and are summarized below.

Sediment Sampling

One sediment sampling event was conducted in November 2013 to collect sediment samples from three locations in the St. Lawrence River (SED-01-SLR, SED-02-SLR, and SED-03-SLR; Figure 7-18). The actual location of each collected sediment sample was recorded using RTK survey techniques. At each targeted location, total water depth was measured and probing was performed to determine material type/depth prior to sample collection. Manual core samples were advanced through the sediment to refusal with the sediment recovered measured and recorded. Each core was split longitudinally, photographed, and observed for physical characteristics (e.g., color, texture, grain size). Sediments were classified by general soil type (sand, silt, clay and organic matter/other matter) and approximate grain size category (fine, medium, coarse), according to the USCS, and observations were recorded in FieldScribe. Observations of sub-bottom conditions encountered during probing were also noted in the FieldScribe (e.g., presence of clay or hard bottom).

Sediment cores were segmented into 0- to 3-inch and 3- to 6-inch samples. Segments were homogenized, processed, and submitted for analysis according to protocol outlined in the PDI QAPP (Alcoa, October 2013). A total of 6 samples were submitted to Pace for PCB Aroclors, total solids, and dry density analyses. QA/QC samples were collected as described in Section 2.1. Appendix A includes the core photographs.

Water Column Sampling

One water column sample was collected in October 17, 2014 from the same location as sediment sample SED-01-SLR (Figure 7-18). Sampling occurred concurrent with the final round of the Grasse River baseline water column sampling (see Section 7.1). The water column sample was collected from the targeted location using a stainless steel Kemmerer water sampler. One sample was collected via boat at 0.5 times the total water column depth. Water quality field parameters were not obtained in the field (i.e., specific conductivity, water temperature, pH, turbidity, and DO) due to equipment malfunction the day of sampling.

All monitoring activities were conducted in accordance with the PDI QAPP and PDI QAPP Addendum No. 1 (Alcoa, October 2013 and December 2014). One field sample was packaged and submitted to Pace for analysis of PCB congeners and TSS. QA/QC samples were collected as described in Section 7.1.

Adult Fish Sampling

The baseline fish sampling in the St. Lawrence River was performed on August 27 and September 3, 2014 in accordance with the PDI QAPP and PDI QAPP Addendum No. 1 (Alcoa, October 2013 and December 2014). The adult fish sampling at this location was performed as part of the Grasse River monitoring program for the first time in 2014 at the request of USEPA. The resident fish species targeted during this program were adult (≥25 cm) smallmouth bass (*Micropterus dolomieui*) and adult (≥25 cm) brown bullhead (*Ictalurus nebulosus*). Fish were collected using boat-mounted electrofishing equipment. A summary of the fish targeted and captured as part of this program is provided in Table 7-3 and discussed below.

Five adult smallmouth bass (skin-on, scales-off New York State standard fillet) and five adult brown bullhead were collected immediately downstream of the Grasse River mouth. Approximate adult smallmouth bass and brown bullhead collection locations are shown on Figure 7-18. The length and weight of each individual bass and bullhead collected are summarized in Table 7-4.

The adult smallmouth bass fillets (skin-on, scales-off New York State standard fillet) and adult brown bullhead fillets (skin-off New York State standard fillet) were packaged in the field and shipped to Pace for processing and analysis of PCB Aroclors and lipids. Samples were collected concurrent with the baseline fish monitoring described in Section 7.2, and therefore the QA/QC samples were prepared by the laboratory from all of the submitted fish samples.

A summary of the results from the St. Lawrence River baseline monitoring is presented in Section 7.3.2.

7.3.2 Summary of Results

PDI data collected during the St. Lawrence River monitoring can be found in Appendix C in the Microsoft Access and EQuIS data tables entitled sediment_field, sediment_aro, water_field, water_iupac, and resfish_aro. The results of each sampling effort are provided below, and the sample locations are shown on Figure 7-18. The data validation report is provided in Appendix B.

Sediment

None of the six sediment samples collected in the St. Lawrence River had detectable PCB concentrations (generally 0 to 3 inch and 3 to 6 inch intervals). These results are consistent with those of the sediment samples collected in the St. Lawrence River in 2007. During the 2007 sampling, three locations were sampled and all PCB results were below the detection limit, with the exception of one sample with a PCB concentration of 0.2 mg/kg (Figure 7-18).

Water Column

The water column sample collected at WCSLR on October 17, 2014 had a TSS level of 1.1 ng/L. No PCBs were detected in this sample. These results are included on Tables 7-1 and 7-2.

Adult Fish

Average lipid-based PCB levels in the St. Lawrence River samples were 53 and 33 mg/kg lipid in smallmouth bass and brown bullhead, respectively. These results are lower than the concentrations measured in the Lower Stretch of the Grasse River, where averages of 86 and 57 mg/kg lipid in smallmouth bass and brown bullhead, respectively, were measured. Sampling results for the fish collected in the St. Lawrence River are included in Table 7-4.